

APPENDIX F  
TREATMENT SYSTEM OPERATIONS

1. Facility Operations Plan. The facility operations plan is prepared by the contractor if required by the Contract. Prior to system start-up and operation, the operations plan should be thoroughly reviewed and understood by all operations personnel. The facility operations plan generally includes information relating to equipment set-up, and system start-up, normal operation, normal and emergency shutdown procedures and routine maintenance requirements. Installation, operation and maintenance manuals for equipment items, if available, should also be incorporated into this plan.

2. Utility Requirements. Utility requirements and consumption rates are site specific and dependent upon the desorption system the Contractor selects. Utilities required at the remediation site to support the thermal desorber unit, air pollution control system, materials handling equipment and auxiliary facilities:

- Electric power (440 volt three phase service is typical for thermal desorber units).
- Water, used typically for cooling of the processed solids and for quench and scrubber makeup.
- Fuel, typically natural gas, propane or fuel oil for supply to burners.
- Compressed air for operation of construction equipment, air driven pumps and process controls. Instrument air must be dry and oil free.
- Nitrogen, purge gas used by some units.
- Chemicals: Lime or caustic soda for wet scrubbers.
- Activated carbon, if used for polishing of off gas or wastewater streams.

The literature of several manufacturers or desorption contractors should be reviewed to estimate the utility requirements.

3. System Start-up. Prior to system start-up, adequate materials handling procedures should be established. Materials handling is discussed in Appendix C.2.

3.1 System Check-Out and Debugging. Thermal desorption systems are generally preassembled and prewired, and transported on flatbed trailers. Most systems are comprised of three primary components: a desorber unit, a particulate removal device and an gas pollution control system.

Check-out and debugging of the thermal desorption system would generally involve inspection and verification of utility tie-ins, and interconnecting piping, wiring and ductwork. Inspection and verification of proper set-up of items unique to a particular thermal desorption system would also be performed at this time. A summary of process control elements can be found in Appendix E. A summary of representative checklist items for thermal treatment systems located in the following documents can be used to develop a checklist for incorporation in the thermal treatment specification:

- CEGS 02288 Remediation of Contaminated Soils and Sludges by Incineration

3.2 Start-Up Procedures. The detailed start-up procedures are included in the contractor prepared operations plan. Start-up procedures define the step by step sequence of activities required to bring the thermal desorption system up to normal operating conditions. The sequence of activities typically would include the following:

- Powering up of system equipment and controls.
- Adjustment of speed controls.
- Setting of control devices to their normal operating points.
- Adjustment of feed rate valves to normal operating set points (e.g.: fuel, water, etc.).
- Adjustment of mechanical components for normal operation (e.g.: dampers, pressure regulators, etc.).
- Operation of the system in both manual "hand" and automatic "auto" mode.
- Monitor and verify normal operation of the system.

3.2.1 Pre Start-Up Inspection. Prior to the start-up of the thermal desorption system leak testing should be performed on each of the system valves; valved segments of piping and ductwork; drain valves; secondary containment systems; and pumps. Valves should be checked to ensure that they remain closed. Spill response supplies are to be inspected and restocked when needed.

Prior to system operation, it is necessary to verify the following items:

- Feed material is appropriately conditioned and characterized;
- Adequate supplies of fuel, makeup water and cylinder gases exist;
- Adequate storage space for treated materials and residuals; and
- Cleanliness of material handling equipment (feed system, off-gas treatment system, and condensate tanks).

A generic start-up procedure follows: The desorber and off-gas treatment systems are to be started in a sequence that does not allow contaminant release. Specifics of dryer startup involve establishing flame in the furnace of the dryer, warming the cylinder to the desired operating temperature, and charging the feed system. The off-gas treatment system startup procedure should be initiated at least one hour prior to the start of feed to the dryer. A specific sequence of starting the off-gas treatment system is to be observed. The sweep gas system is started first, then the gas monitors (CO, Organics, and O<sub>2</sub>) should be started to allow for a warm up period. Specifics regarding the sequence of the off-gas treatment unit are system specific and dependent on the system design.

Start up procedures for a thermal desorption system are established to ensure that operation of the treatment system does not compromise the safety of the personnel, of the process, or create any damage to the system.

General components of a thermal desorption system which require specific procedures for start-up include the following:

- Electric power source;
- Fuel sources/supply;
- Sweep gas supply/system;
- Off gas blowers;
- Temperature alarms and monitors;

- Pressure alarms and monitors;
- Oxygen alarms and monitors;
- Off-gas treatment alarms and monitors for pressure and temperature;
- Product handling system; and
- Dryer system.

System specific detailed operating procedures for thermal desorption unit startup, normal operation, shutdown and emergency situations are established by the thermal desorption contractor and or unit manufacturer. The system operating manual should be made available at the site.

3.3 Start-Up Sampling Plan. CEGS 01450 Chemical Data Quality Control should be edited to include the appropriate requirements for start-up. Sampling to verify the normal processing rates and contaminant concentrations of waste feed to the thermal desorber unit and the normal production rates and contaminant concentrations of process residuals should be performed prior to placing the thermal desorption system into continuous operation. The frequency of routine quality control sampling may be reduced during continuous operation on materials from the same contaminated area.

Start-up sampling may include the following:

- Sampling and analysis of waste feed stockpile.
- Sampling and analysis of residual solids at the stockpile. Treated materials should be analyzed in accordance with the Toxicity Characteristic Leachate Procedure (TCLP) for the presence of metals above threshold limits as defined in 40 CFR § 261.
- Sampling and analysis of scrubber blowdown and fabric filter solids.
- Sampling and analysis of the stack gas.
- Sampling of all temperatures, pressure, flow rates (where possible) and chemical analysis of the solids, liquids and gases at the inlet and outlet of each unit in the process. This will be used to determine if each unit is operating as designed.

If analysis of any of these streams indicates that the desorption system is not meeting performance requirements, the appropriate adjustments can be made to the control set points before placing the system into normal operation.

ER 1110-1-263, Chemical Data Quality Management for Hazardous Waste Remedial Activities; and EM 200-1-3, Requirements for Preparation of Sampling and Analysis Plans contain requirements governing quality assurance requirements for sampling and analysis.

4. Treated Materials Management Plan. Treated materials not found to be a characteristic hazardous waste by toxicity may be used for backfill on-site or disposed of in a non hazardous landfill. Treated materials that fail the TCLP metals will need to be stabilized by solidification and/or disposed of at an approved RCRA landfill. Applicable requirements regulating the transport of such materials must be met.

5. Site Safety and Health Plan. CEGS 01110 Safety Health and Emergency Response (HTRW/UST) contains the Contract requirements for the Site Safety and Health Plan.

Information relating to USACE safety and health requirements can be found in the following documents:

- Safety and Health Requirements Manual: EM 385-1-1
- Safety and Occupation Health Document Requirements for Hazardous Toxic and Radioactive Wastes: ER-385-1-92

The safety and health plan will incorporate requirements for employee training, protective equipment, medical surveillance, and the contingency plan for workers entering the exclusion and contamination reduction zones.

6. Shutdown Procedures.

6.1 Normal Shutdown. Normal shutdown procedures will vary with the particular thermal desorption system selected and are generally included in the facility operations plan. Normal shutdown procedures define the detailed sequence of activities required to cease waste feed, fuel feed and power to the thermal desorption system and enable the thermal desorber to safely cool down.

6.2 Emergency Shutdown. Emergency shutdown procedures are generally included in the facility operations plan and typically consists of the following sequence of activities:

- Shut off of both feed and burners (If a hot kiln is stopped from rotating, it could warp).
- Sound the appropriate facility emergency alarms.

- Disconnect the main power feed to the thermal desorption system.
- Follow the Site Safety and Health Plan.
- Investigate and report the cause of the incident.
- Modify operations in accordance with the incident findings and recommendations

7. Labor Requirements. Construction and operating labor requirements are site specific and will vary depending upon the size and complexity of the thermal desorption system selected and the quantity of contaminated material to be treated. Labor requirements may include the following:

- Mobilization and demobilization.
- Erection and set-up of processing equipment and site auxiliary facilities.
- Excavation and transport of contaminated materials and transport of process residuals.
- Feed operation.
- Start-up and operation of processing equipment.
- Maintenance of processing equipment and auxiliary facilities.
- Sample collection, preservation, shipment and analysis.
- Backfill operation.
- Construction Quality Assurance.
- Security personnel.
- Supervisory personnel.
- Site Safety and Health Officer.

8. Sampling Plan. The sampling plan should be detailed enough to monitor the operation of the thermal desorber and to demonstrate compliance with applicable regulations. Sampling programs for thermal desorbers are not required to be as comprehensive as sampling programs for incinerators.

A thermal desorber quality control sampling plan may include:

Process Control Monitoring - The process controls required to maintain quality during the remediation include pressure measurements, flow measurements, temperature measurements, and air pollution control sampling and measurements.

Data acquisition and collection systems collect data, process it in a desired fashion, and record the results in a form suitable for storage, presentation, or subsequent processing. For example, a record potentiometer is a simple data acquisition system that may be used for collecting temperature data from thermocouples.

9. Analytical Accuracy. Data evaluation should be conducted according to project specific plans (contractor and government) produced in accordance with CEGS 01450 and ER 1110-1-263.

10. Corrective Action Plan. Corrective action procedures are implemented for on activities which do not meet the specifications outlined in the design and construction package. Corrective actions are usually addressed on a case-by-case basis for each project. The need for corrective actions is based on predetermined limits for acceptability. For example, activities which result in the implementation of a corrective action plan include the following:

- Samples which do not meet the specifications;
- Activities are substantially behind schedule;
- Treated soil does not meet specified requirements;  
or
- Incidents causing injury or down time.

The corrective action would include activities to rectify the problem. A corrective action should include resampling and reanalyzing samples for analytical problems and retreating contaminated materials that contain residual organics. The Corrective Action Plan Report would outline activities to be executed to rectify the specified problem and to preclude recurrence.

11. Maintenance Requirements. Equipment operation and maintenance instructions will generally include information regarding routine maintenance and troubleshooting. These

instructions should be incorporated into the overall facility operations plan.

The frequency of routine maintenance will vary depending upon the type and throughput of the materials handled and the complexity of the equipment item.

11.1 Cleaning. Maintenance procedures may specify the periodic cleaning of the desorber inlet and discharge ports and transport belt, if furnished, residue collection devices, conveyor belts and screws, feed hoppers and meters, particulate removal devices and filter media.

11.2 Lubrication. Maintenance procedures will typically specify the periodic lubrication of rotating and moving parts of equipment and machinery components including bearings, shafts, chain drives, gearing, and any friction producing components.

11.3 Inspection. Routine inspection procedures will vary widely depending upon the thermal desorption system selected. Operations personnel should refer to the facility operations plan for details.

11.4 Media Regeneration or Replacement. Routine maintenance procedures will typically include instructions for the periodic regeneration of ion exchange media and the regeneration or replacement of activated carbon if such equipment is incorporated into the particular thermal desorption system used.

11.5 Spare Parts. The operation and maintenance instructions furnished by the contractor will generally include recommended spare parts lists. The inventory of spare parts that must be maintained at the remediation site will depend upon the complexity of the particular thermal desorption system used and the projected life of the remediation project. Parts of the technology that are prone to break down or have high wear and tear demands should have readily available replacements onsite or in a nearby locations. Parts associated with materials handling, such as auger or screw conveyors that move soil in and out of the unit, are particularly susceptible to break down.